

WHAT WE CLAIM IS:

1. A lined multi-branch fitting comprising:

a one-piece multi-branch hollow liner having a plurality of intersecting nonmetallic hollow cylindrical branches in fluid communication with each other;

a plurality of individual confronting metal housing members, assembled over and snugly receiving said nonmetallic branches, having confronting terminal ends disposed in confronting relation with each other; and

a fillet weld bead integrally coupling said terminal ends of said confronting terminal ends of said metal housing members together in sealed relation with each other.

2. The lined multi-branch fitting set forth in claim 1 wherein said metallic housing members each comprises a radially inner portion having a radially inner surface snugly receiving said liner and a radially outer portion having a radially outer surface; said radially inner portion of one of said housing members including an end face provided with a notch adjacent said liner; said inner portion of the other of said confronting metallic housing members including a confronting end face housing, a male projection complementally formed to, and received by, said notch, and abutting said liner.

3. The lined multi-branch fitting set forth in claim 2 wherein said fillet weld bead is disposed radially outwardly of said male projection.

4. The lined multi-branch fitting set forth in claim 3 wherein said radially outer portions each includes a terminal end face; said terminal end face of said metallic housing member which includes said male projection being relieved in a direction away from said male projection to provide a radially outwardly opening recess for receiving said fillet weld bead.

5. The lined multi-branch fitting set forth in claim 1 wherein said metallic housing members each includes a radially inner portion having a radially inner surface snugly receiving said liner and a radially outer portion; said radially inner portions including complementally formed nested male and female terminal end portions.

6. The lined multi-branch fitting set forth in claim 5 wherein said weld bead is radially outward of said male projection.

7. The lined multi-branch fitting set forth in claim 6 wherein said radially outer portions each includes a terminal end face; said terminal end face of said metallic housing member which includes said projection being circumferentially relieved in a direction away from said male projection to provide a radially outwardly opening recess for receiving said fillet weld bead.

8. The lined multi-branch fitting set forth in claim 1 wherein one of said confronting terminal ends comprises a radially outer arcuate portion having a first terminal end face and an integral, radially inner, liner receiving arcuate portion having a terminal male projection which projects beyond said first terminal end face of said radially outer arcuate portion; said male projection including a second terminal end face; another of said confronting terminal ends comprising a second radially outer arcuate portion having a third terminal end face and an integral, radially inner, liner receiving arcuate portion having a fourth terminal end face which is recessed relative to said third end face to form a notch for complementally receiving said male projection; said second terminal end face being disposed in abutting relation with said fourth terminal end face.

9. The lined multi-branch fitting set forth in claim 8 wherein said first terminal end face is relieved in a direction away from said third end face to provide a radially outwardly opening weld recess for receiving said fillet weld bead.

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D 9/10. The lined multi-branch fitting set forth in claim 8 wherein said radially outer and inner arcuate portions of one confronting terminal end have first and second radial thicknesses, respectively; said radially inner and outer arcuate portions of the other confronting terminal end have third and fourth radial thicknesses, respectively, substantially equal to said first and second radial thicknesses, respectively; said fillet weld bead integrally fusing said radially outer portion of said other confronting terminal end confronting metallic member to said radially inner portion of said one confronting terminal end.

11. The lined multi-branch fitting set forth in claim 1 wherein said liner includes a hollow cylindrical base having opposite ends and a transversely disposed integral cylindrical neck projecting from said cylindrical base between said opposite ends;

said confronting metallic housing members including

confronting, elongate hollow cylindrical metal bases receiving said opposite ends of said liner, and

confronting substantially semi-cylindrical transversely extending, integral neck portions, integral with said cylindrical metal bases, receiving opposite sides of said cylindrical neck of said liner .

12. The multi-branch fitting set forth in claim 11 wherein said metallic housing members each include radially inner arcuate portions of a predetermined radial thickness and having a radially inner surface snugly receiving said liner and radially outer arcuate portions of a second predetermined radial thickness having a radially outer surface;

said radially inner arcuate portion of one of said metallic housing members including an end face provided with an elongate notch adjacent said liner;

said radially inner potion of the other of said confronting metallic housing members including an elongate male strip projection complementally received by said notch and abutting said liner;

said radially outer portion of said other metallic housing member being relieved in a direction away from said radially inner male strip projection to provide a radially outwardly opening weld bead receiving opening receiving said weld bead.

D 13. The multi-branch fitting set forth in claim 12 wherein said elongate male strip projection provides a heat barrier to partially inhibit the transmission of heat from said radially outer arcuate portion of said one metallic housing member to said liner.

14. The lined multi-branch fitting set forth in claim 1 wherein said liner includes a hollow cylindrical base having opposite ends and a transversely disposed integral cylindrical neck projecting from said cylindrical base between said opposite ends;

said confronting metallic housing members including first and second axially aligned hollow metal cylinders snugly receiving said opposite ends of said liner and a transversely disposed third hollow cylindrical metal cylinder snugly receiving said neck of said liner.

15. The lined multi-branch fitting set forth in claim 14 wherein the confluence of the confronting terminal ends of said first, second and third hollow cylindrical metal cylinders (includes) radially inner heat barrier means of a predetermined radial thickness on a radially inner portion of at least one of said cylinders for partially inhibiting the transfer of heat from radially outer portions of the adjacent cylinders to said liner.

16. The lined multi-branch fitting set forth in claim 1 wherein said confronting terminal ends include radially inner and outer portions, said radially inner portion of said confronting end of

one of said metal housing members including heat barrier means for inhibiting weld heat generated in a radially outer portion of said confronting end of the other of said metal housing members, as said fillet weld bead is being formed, from transferring to said liner.

17. The lined multi-branch fitting set forth in claim 16 wherein said heat barrier means comprises a male projection on said one of said confronting metallic housing members and a cooperating female notch on another of said other confronting metal housing members receiving said male projection.

18. The lined multi-branch fitting set forth in claim 16 including insulating means, integrally formed on a radially inner portion of said confronting terminal end of one of said housing members, for insulating a portion of said liner adjacent a radially inner portion of said terminal end of another of said confronting housing members from weld bead applied to a radially outer portion of said terminal end of said other housing member.

19. The lined multi-branch fitting set forth in claim 18 wherein said insulating means comprises a radially inner strip projecting in a direction outwardly away from said terminal end of said one housing member to a position between said liner portion and said radially inner end portion of said another metal housing member.

20. The lined multi-branch fitting set forth in claim 19 wherein said radially inner end portion of said another metal housing member comprises a radially inwardly opening notch provided in said radially inner portion of said terminal end face of said another metal housing member.

21. A lined multi-branch fitting comprising:

a one-piece multi-branch hollow liner having a plurality of angularly related, intersecting hollow branches, each having an axis, in fluid communication with each other;

a plurality of metal housing members, assembled about different ones of said hollow branches, having confronting terminal ends disposed in confronting relation with each other; said confronting terminal ends including complementally formed radially inner female and male parts which mate with each other and snugly receive said liner; said confronting metal housing members including radially outer portions having terminal end portions radially outwardly of said radially inner portions; said radially outer terminal end portions of said metal housing member which includes said male part being circumferentially relieved radially outwardly of said male part in a direction away from said male part to provide a radially outwardly opening weld recess; and a weld metal bead received in said weld recess radially outwardly of said mating female and male parts for welding said confronting terminal ends together.

13. 22. The lined multi-branch fitting set forth in claim 21 wherein said weld bead comprises a fillet weld bead.

23. In a multi-branch fitting having a metal housing lined with a one-piece non-metallic hollow multi-branch liner having a plurality of angularly related hollow cylindrical ends; said metal housing comprising:

a plurality of individual metal housing members which are disposed over said plurality of hollow ends in confronting relation with each other; each of said metal housing member including a radially outer arcuate portion, and an integral radially inner arcuate portions having radially inner surfaces snugly receiving said liner; said radially inner arcuate portions of adjacent confronting metal housing

members including complementally formed male and female parts disposed in nested relation with each other; and

a fillet weld metal bead disposed radially outwardly of said male and female parts coupling said confronting metal housing members together.

D 17 24. The multi-branch fitting set forth in claim 23 wherein said radially outer arcuate portion of said metal housing member which includes said male part being circumferentially relieved in a direction away from said male part to provide a radially outwardly opening weld recess for receiving said weld metal bead.

25. A lined multi-branch fitting comprising:

first and second metallic structural members assembled to form a hollow cylindrical base with opposite ends and a transversely disposed cylindrical neck projecting from said base between said opposite ends;

said structural members each having a terminal end disposed in confronting relation with the terminal end of the other structural member;

a one-piece T-shaped hollow liner of heat degradable material having a plurality of intersecting hollow branches in fluid communication with each other, lining the surface of said first and second metallic members;

said terminal end of said first metallic member having a radially inner edge having a radially inner, radially inwardly opening, female recess radially inwardly adjacent a radially outer elongate projection;

said terminal end of said second metallic member including

a radially inner edge having a projecting tongue bearing against said liner and received by said female recess, and

a radially outer, annularly extending weld recess radially outwardly of said radially inner male projection confronting said radially outer elongate projection; and

weld metal received in said weld recess to provide an annular fillet weld bead welding said first and second metallic structural members together.

146 26. A lined multi-branch fitting comprising:

a one-piece multi-branch hollow non-metallic liner of heat degradable material having at least three intersecting hollow cylindrical branches in fluid communication with each other;

a plurality of metal housing members assembled about said hollow cylindrical branches and having complementally formed radially inner portions snugly receiving said hollow branches and radially outer portions disposed in confronting relation with each other;

one of said radially inner portions having

a terminal end defining a circumferentially extending male strip projection;

the other of said radially inner portions having a circumferentially extending radially inwardly opening notch complement to said male strip projection snugly receiving said male strip projection;

said radially outer portions including terminal ends, one of said terminal ends being circumferentially recessed relative to the other terminal end to provide a radially outwardly opening weld recess therebetween; and

a fillet weld received in said recess for welding said outer portion of one housing member to the inner portion of the other housing member.

27. A lined multi-branch fitting comprising:

a one-piece multi-branch non-metallic liner having a plurality of intersecting hollow cylindrical branches in fluid communication with each other;

a plurality of metal housing members assembled about said hollow branches including,

radially inner complementally formed, confronting terminal end portions disposed in abutting relation and snugly receiving said liner, and

radially outer portions having terminal end faces, one of said end faces being recessed relative to the other terminal end face to provide a radially outwardly opening weld recess; and

an annular bead of weld metal received in said weld recess radially outwardly of said inner portions to secure said metal housing members together.

28. The lined multi-branch fitting set forth in claim 27 wherein said radially inner portion of one of said metal housing members includes a radially inwardly opening notch and the radially inner portion of the other of said metal housing members comprises a male strip projection complementally received by said notch; said one end face on said other metallic housing member being recessed to provide said radially outwardly opening weld recess.

29. The lined multi-branch fitting set forth in claim 28 wherein said weld metal comprises a fillet weld bead.

30. A lined multi-branch fitting comprising:

metal housing members assembled about a preformed one-piece hollow heat degradable liner having a plurality of hollow intersecting branches, each having an axis, with the external portions of the joints between said housing members joined by weld metal; and

wherein said joints include radially inner portions comprising a slot adjacent said liner on one of said housing members and a male strip projection on the other of said housing members received by and complementally formed to said slot to provide a heat barrier to inhibit the transfer of any heat generated during the welding process from transferring from said external portion of said one housing member to said liner.

31. The multi-branch fitting set forth in claim 30 wherein said metal housing members comprise two axially aligned hollow cylinders and a transversely disposed metal cylindrical stack.

32. The multi-branch fitting set forth in claim 30 wherein said metal housing members comprise two axially aligned hollow cylinders each having an axially inner end integrally coupled to a transversely disposed, substantially semi-cylindrical, metal stack for mating with the other stack stub end to form a cylindrical stack.

33. A lined multi-branch fitting comprising:

a preformed one-piece liner of heat degradable material having a plurality of intersecting non-metallic, hollow cylindrical branches in fluid communication with each other;

a plurality of metal housing members assembled about said pre-formed liner including adjacent inner ends each having radially outer and radially inner end portions;

a fillet weld bead joining a radially outer portion of one of said housing members to the other of said housing members; and

insulating means on said radially inner end portion of one of said housing members for insulating a portion of said liner adjacent said radially inner portion of said one housing member from any heat in said radially outer portion of said one housing member.

~~34.~~ The lined multi-branch fitting set forth in claim ~~35~~ wherein said insulating means comprises a radially inwardly opening notch provided in said radially inner end portion of said one housing member and a male projection on said radially inner end portion of said other housing member received by said notch and abutting said liner.

~~D 26~~ <sup>1925</sup> ~~35.~~ The lined multi-branch fitting set forth in claim ~~34~~ wherein said plurality of metal housing members comprise two axially aligned, hollow cylinders having axially inner confronting ends; each of said inner ends including a transversely disposed, substantially semi-cylindrical, metal half stack for mating with the other half stack to form a cylindrical stack.

~~A~~ <sup>20</sup> ~~36.~~ The lined multi-branch fitting set forth in claim ~~35~~ wherein said radially outer portion of said one housing member includes a radially outwardly opening weld grove and wherein said plurality of metal housing members comprise two axially aligned hollow cylinders and a transversely disposed, hollow cylindrical stack.

~~37.~~ A method of fabricating a lined, multi-branch fitting comprising the steps of:

~~selecting a one-piece multi-branch hollow non-metallic liner having a plurality of hollow, angularly offset cylindrical branches in fluid communication with each other;~~  
~~assembling, in confronting relation about said branches of said liner, a plurality of confronting metal housing members having cylindrical portions receiving said branches and terminal end faces disposed in confronting relation with each other;~~  
~~fillet welding said confronting housing members together by applying weld heat to said radially outer portion of said one metal housing member; and~~

insulating portion of the liner adjacent a radially inner portion of one of said metal housing members from weld heat applied to ~~said radially outer portion~~ of said one metal housing member.

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38. The method set forth in claim 37 wherein said insulating step is accomplished by disposing a male strip, projecting from a radially inner edge portion of said terminal end face on the other of said confronting housing members, into a complementally formed notch provided on a radially inner portion of an end face of said one confronting housing member.

39. The method set forth in claim 38 wherein said welding step is accomplished by forming a radially outwardly opening weld receiving groove in a radially outer portion on said other confronting member and filling said groove with weld metal.

40. The method set forth in claim 39 wherein said groove forming step is accomplished by relieving a radially outer portion in said other housing member radially outwardly of said male projection in a direction away from said male projection to define said radially outwardly opening weld receiving groove.

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B 41. The method of fabricating a lined multi-branch fitting set forth in claim 35 wherein said insulating step is accomplished by using a part of another of said confronting metal housing members from insulating said portion of the liner from weld heat applied to said one metal housing member.

42. The method set forth in claim 41 wherein said using step is accomplished by disposing a radially inner, strip projecting outwardly from said terminal end face of said another metal housing member between said liner and a radially inner end portion of said one metal member adjacent said terminal end face of said one metal housing member.

43. The method set forth in claim 42 wherein said disposing step is accomplished by providing a radially inwardly opening notch along the radially inner edge of said terminal end face of said one metal housing member adjacent said liner and inserting said strip on said other housing member into said notch; and said fillet welding step is accomplished by applying weld head to a radially outer portion of said one metal housing member.

44. The method set forth in claim 43 wherein said welding step is accomplished by applying more weld heat to said one housing member than is applied to said other housing member.

45. The method of fabricating set forth in claim 44 wherein said fillet welding step is accomplished by relieving said terminal end face of said other metal housing member in a direction away from said strip to provide a weld recess and then filling said weld recess with weld metal.

46. The method set forth in claim 41 wherein said insulating step is accomplished by using a radially inner portion of said terminal end face of said confronting metal housing members for insulating said liner portion from said weld heat applied said one metal housing member.

47. A method of fabricating a lined, multi-branch fitting comprising the steps of:

selecting a one-piece multi-branch hollow non-metallic liner having a plurality of angularly related hollow cylindrical branches in fluid communication with each other;

assembling about said liner branches a plurality of metal housing members having cylindrical portions receiving said branches and terminal end faces disposed in confronting relation with each other;

said assembling step being accomplished by inserting a male insulating strip projecting from a radially inner edge of said end face of one of said housing branches into a complementally

formed notch provided on the radially inner terminal end of the other of said housing members to insulate the adjacent portion of said liner from the radially outer portion of said other housing member; and

fillet welding said radially outer portion of said other housing member to said one housing member;

48. The method set forth in claim 47 wherein said step of fillet welding is accomplished by forming a radially outwardly opening weld receiving groove in a radially outer portion of said one housing member and said fillet welding step is accomplished by depositing metal into said groove.

49. The method set forth in claim 48 wherein said welding step is accomplished by applying more heat to said radially outer portion of said other housing member than is applied to said one housing member.

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